

Why Do Eclipses Happen?

MATERIALS (Per pair of students):

- A yardstick

You can have the students make and measure these:

- A 1 inch ball, made of clay or Styrofoam (Earth model)
- A 1/4 inch ball, made of clay or Styrofoam (Moon model)
- Two small sticks or toothpicks for inserting into the balls
- Two binder clips for attaching the sticks to the yardstick
- If you are inside, you will also need one lamp **with a bare bulb** for the classroom so that the light comes from a single source. (Not overhead fluorescents) This will be the Sun.

This Activity Needs to be Done in a Darkened Room or Outside on a Sunny Day
(so you can see the shadows)

First, Have Each Pair Make an Earth-Moon Scale Model:

To Do:

Put each ball on the end of its own small stick or toothpick.

To Say:

Here are models, or smaller versions, of the Earth and Moon (Hold up 1" ball for the Earth and 1/4" ball for the Moon) and here is a yardstick. How far apart do you suppose the Earth and Moon are on this scale? Clip the Earth here at the 4" mark.

Let's take some ideas of where we need to place the Moon to make this to scale.

You can give older students a hint about the distances in the Background above.

To Say:

You can fit about 30 Earths between the Earth and Moon. The Earth is 1 inch, so how far away will the Moon be? We'd need to place this Moon-bead 30 inches from our Earth ball. What mark will you want to clip the Moon to? (34")

Background:

- The Moon is roughly 2,000 miles in diameter and the Earth is about 8,000 miles in diameter.
- The Moon's average distance from Earth is about 240,000 miles.
- In a scale model, this makes **the Moon's distance from Earth thirty times the diameter of Earth.**

Lunar Eclipse Demonstration:

To Say:

So now, what's an eclipse? There are two types of eclipses, *lunar eclipses* and *solar eclipses*.

Let's make a lunar eclipse first. That's when the Moon passes through the Earth's shadow.

Where does the Moon have to be to go through the shadow of Earth? *On the opposite side of the Sun.*

Eclipse comes from the Greek verb that means, "to vanish". An eclipse occurs when one object moves in front of another and creates a shadow.

If you have already studied Moon Phases you can ask, "What phase is the Moon at that time?" *Full.*

Try to move Moon-bead into Earth-bead's shadow and make a lunar eclipse. You can make the point that it is not easy for the Sun, Earth, and Moon to be perfectly aligned! If the person is having difficulty, have them project the Earth's shadow onto their hand.

To say:

Would everyone on the night side of Earth be able to see the lunar eclipse? *Yes!*

Solar Eclipse Demonstration:

To Say:

Great! Now let's make a solar eclipse. That's when the Moon casts a shadow on the Earth. Where does the Moon have to be to do that? *Between the Earth and Sun.*

To Do:

Align the Moon-bead toward the Sun and cast a shadow on the Earth-bead.

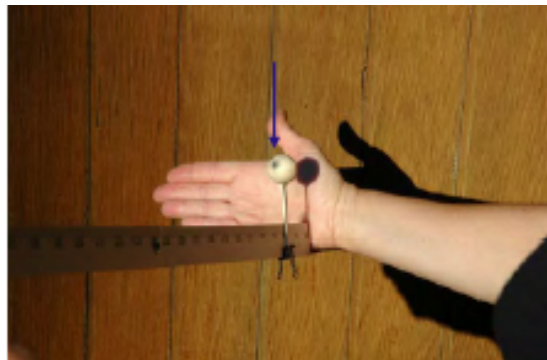
Have everyone try to make a solar eclipse. (The arrow in the photo below is pointing to the Moon bead's shadow on the Earth ball.) Again, it can be helpful to use your hand to find the Moon's shadow.

To say:

From where on Earth would the solar eclipse be visible?

Just the part where the Moon's shadow crosses!

It is much harder to see a solar eclipse because you have to be in just the right place. So, even though solar and lunar eclipses both happen about twice a year on average, it is rare that you will see the solar eclipse.



If you have already studied Moon Phases you can ask, "What phase is the Moon at that time?" *New.*

Follow-up Questions:

When do you see a lunar eclipse, during the day, or at night? *At night.*

What about a solar eclipse? *During the day.*

Why don't eclipses happen every month?

The Moon orbits the Earth about once a month (every 29.5 days), so why doesn't the Earth cast a shadow on the Moon every month when the Moon gets full? Well, they are not usually lined up. Usually, the Moon is a little above or below the Earth's shadow, so there is only a full Moon, not a lunar eclipse.

You can find out more, including dates of upcoming eclipses, at NASA's Eclipse Homepage:

<http://sunearth.gsfc.nasa.gov/eclipse/eclipse.html>